OUTPUT 5. IMPACT OF SN – 3 PROJECT ACTIVITIES DOCUMENTED

Developing pyrethrum as a cash crop in Kabale District: The challenges

Researchers: Pamela Pali[90] and Pascal Sanginga[91]

Introduction

Beyond Agricultural Productivity to Poverty Alleviation (BAPPA) was a pilot project that began its activities in 2001 in eastern and southern Africa. The activities of BAPPA were taken over by the Enabling Rural Innovation (ERI) project, where the implementing partner in Kabale is CIAT. The key processes of the ERI project include the beneficiary-based diagnosis of opportunities and constraints, and market opportunity analysis through which food security and agroenterprise options are identified. In addition, the ERI project working principles bring together sustainable natural resource management (NRM), equity and gender. The project builds on the farmers' existing knowledge through farmer participatory research tools to empower them in their decision-making processes. Community appraisals and market opportunity identification (MOI) were conducted in two communities of the Kabale district (Rubaya subcounty), the Karambo Tukore and the Muguli B Turwanise Obworo groups. Along with a food-security option, pyrethrum or Dalmatian chrysanthemum was selected as an enterprise option based on market information generated from the MOI and decision-support tools (an ex ante cost-benefit analysis) by both groups.

Agro-Management Group Inc. is a California-based company, which made its first investment in pyrethrum production, marketing and processing through Agro-Management (U) Ltd., its subsidiary company based in Kabale, Uganda in 1991. Agro-Management (U) Ltd. has supported pyrethrum flower production in Kabale and more recently in western Uganda through its outgrower scheme and is the monopolistic market for pyrethrum produced in Uganda. The pyrethrum processing plant in Kabale has been in operation since 2000.

Pyrethrum has been grown in Kabale since 1945. It is a daisy-like chrysanthemum from which pyrethrum powder is produced. About 25 kg of flowers can be processed into 1 kg of crude extract, which contain pyrethrins. Pyrethrins are six insecticide components (esters) occurring in the crushed flower. It is used as an insecticide and acaricide, and the residue is used for animal feeds. It acts as a nerve agent on insect pests, killing them instantly. No real insect resistance occurs. Pyrethrins easily break down under ultraviolet light, leaving no residue in the environment. It is nontoxic to humans and cannot enter the food chains.

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The farmer research groups

Farmers from the two communities went to Bufundi Subcounty on an exploratory visit, after which adaptive research began with the Farmer Research Group (FRG) on behalf of the community, using various soil-management techniques. Input facilitation and technical guidance were provided by Agro-Management. The farmers' principle contribution was group labor. The experimental farmers had an interest in the resource and input requirements; the activities and the timing of these activities involved pyrethrum management. Research questions centered on the soil quality required for pyrethrum production and how to utilize locally available amendments to enhance soil fertility. Both locally available and purchased inputs (inorganic fertilizers) were used in the experiment. Figure 1 shows a scientist and the experimental farmers in a pyrethrum field.

Figure 1. CIAT scientist with pyrethrum farmers in their field.

Agro-Management has recently discontinued payment of its outgrowers hence; there may be a need for further enterprise selection. Prior to the foregoing activity, an ex post economic evaluation of the enterprise is required to determine the actual worth of pyrethrum production. Thus this study gives an economic evaluation of the pyrethrum, determining:

- ✓ Annual production trend analysis by group considering weather patterns and labor demands
- ✓ Farmer perceptions of pyrethrum production
- ✓ Economic evaluation of pyrethrum production by the FPR groups, groups facilitated by Agro-Management, and individuals growing pyrethrum.

Methodology

This study was conducted in the southwestern region of Kabale (Ndorwa and Rubanda counties), which were characterized into high- and low-concentration pyrethrum-growing areas by Agro-Management, based on the production levels of the crop. One group was selected per parish and one individual per village. The Muguli B and Karambo groups were located in the low-concentration area and were selected for comparison purposes. Table 1 shows the sample selection procedure.

Table 1. Sample selection procedure for pyrethrum growers in Kabale.

Concentration Area	Counties	Subcounty	Village	N
Low	Ndorwa	Rubaya	Katabura	3 groups * 10 people = 30
			Kagyera	3 individuals belonging to group
			Muguli A	3 individual pyrethrum growers
			Muguli B	
			Kalambo	**36 farmers**
High	Rubanda	Bufundi	Buhanjura	4 groups * 10 people
			Kisenyi	2 individuals belonging to groups
			Kashaasha	4 individual farmers
			Kacherere	
		Muko	Nyarurangi	
			Kibungo	**46 farmers**
Total sample size				82 farmers

Quantitative and qualitative data were collected for the study. Focus group discussions (FGDs) were held with the seven farmer groups. The economic analysis was conducted for the experimenting group, Agro-Management-supported groups and individual growers. For the economic analysis of study, the recall method of data collection was used. Then an ex post cost-benefit analysis was conducted to determine the costs incurred and returns on pyrethrum production for each group. The individual farmers were interviewed. Production data and other supporting information were collected from Agro-Management to complement the results of this study. The data were analyzed to produce frequencies and other descriptive statistics. Production trends, pyrethrum area under production in comparison with other crops, and farmers' perception of pyrethrum were also determined by concentration area. The costs-benefits were analyzed using a partial budget for the Agro-Management-supported groups and the FRG.

Results

Annual production trend analysis, 2000-2003

According to 73.7% of the farmers, the area under pyrethrum had not changed since they began its production. Of the farmers who had reported a change in land areas under pyrethrum, 15% reported that this area had increased in size, while 10.5% reported a decline. The reasons given for the increase in the area were that pyrethrum is associated with high returns (15.8%), a market is available (10.5%), and it is more profitable than other crops (5.3%); whereas the reason for the decline in pyrethrum production is that there was no market (10.5%). Other major hindrances to smallholder production are the lack of planting material, the belief that pyrethrum is a nutrient depleter, and that the plants are poisonous. Despite the ready market for the product, the Kabale farmers cannot meet the demand required for the processing plant to operate at full capacity. Agro-Management extension personnel reported that pyrethrum is basically grown as a leisure

crop; and when farmers are not busy with other on-farm activities, they devote their extra time and family labor to pyrethrum production.

Figure 2 shows the area under pyrethrum production from 2000-2003. It can be seen that growers have decreased the area under production over this period. Most farmers had from 0.1-1.5 acres under pyrethrum production; a few had more than two acres. In 2000-2001, more of the farmers had smaller areas under production than in any other year. After 2001 the area under production began to decline, with a drastic fall in 2003 when some 8 farmers had abandoned pyrethrum production.

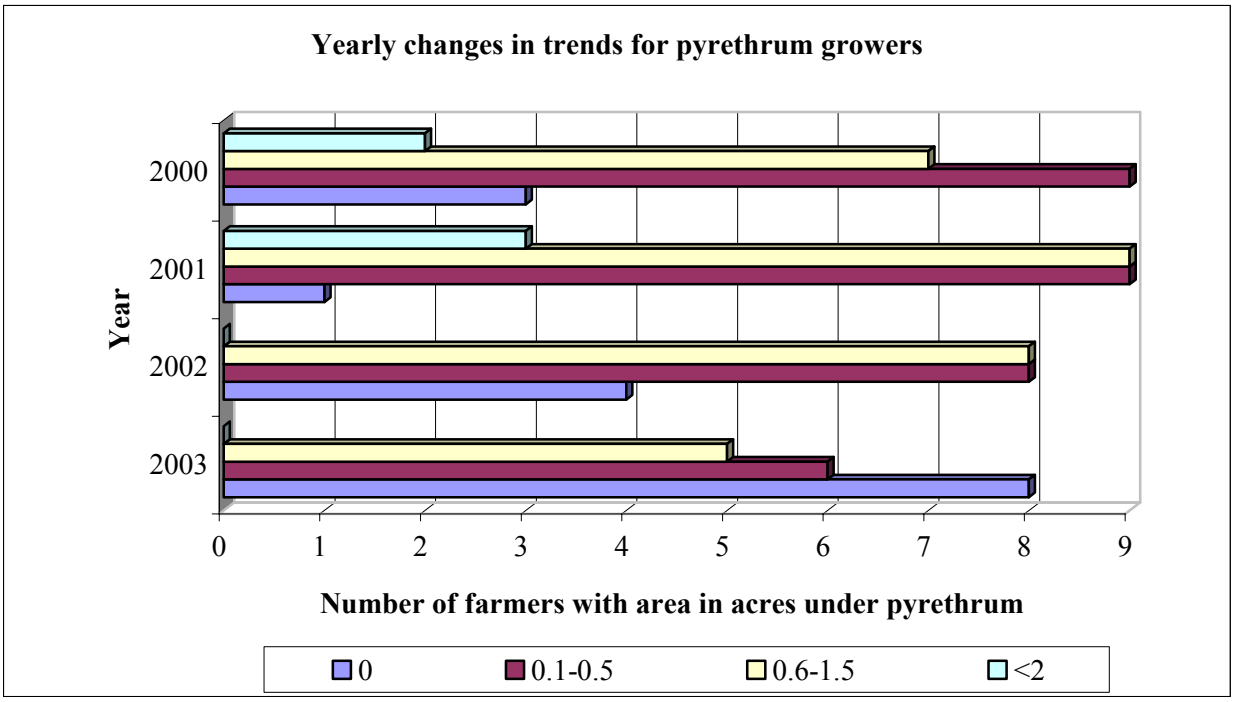

Figure 2. Annual changes in trends of area under pyrethrum production.

The peak production months are from March-July, while the low production months are from October-December. Labor for harvesting the crop competes with labor for planting and weeding common beans and Irish potatoes. Pyrethrum is harvested during the drier months and does not coincide with the long rains, which occur from December-January. Production is lower during the wet months. In the months of January-April, activities of other crops interfere with those of pyrethrum.

The labor activities (based on farmers' reports) involved in pyrethrum production in comparison to the major crops are shown in Figure 3. There is strong competition for pyrethrum labor from January-March. The African Highlands Initiative (AHI, 1998) reported that farmers in Rubaya experience peak labor between January-April and August-September. The opportunity cost of the farmer's time is high as there is no time in the year when the competition for pyrethrum labor with that of other crops is less intense. Food security is most intense in April-June and rises in

December. This is at the time when pyrethrum production is at its peak harvesting period, thereby providing a cash base for farmers to relieve this food-insecurity period. In November-December, however, income from pyrethrum cannot be used for food insecurity because production is low.

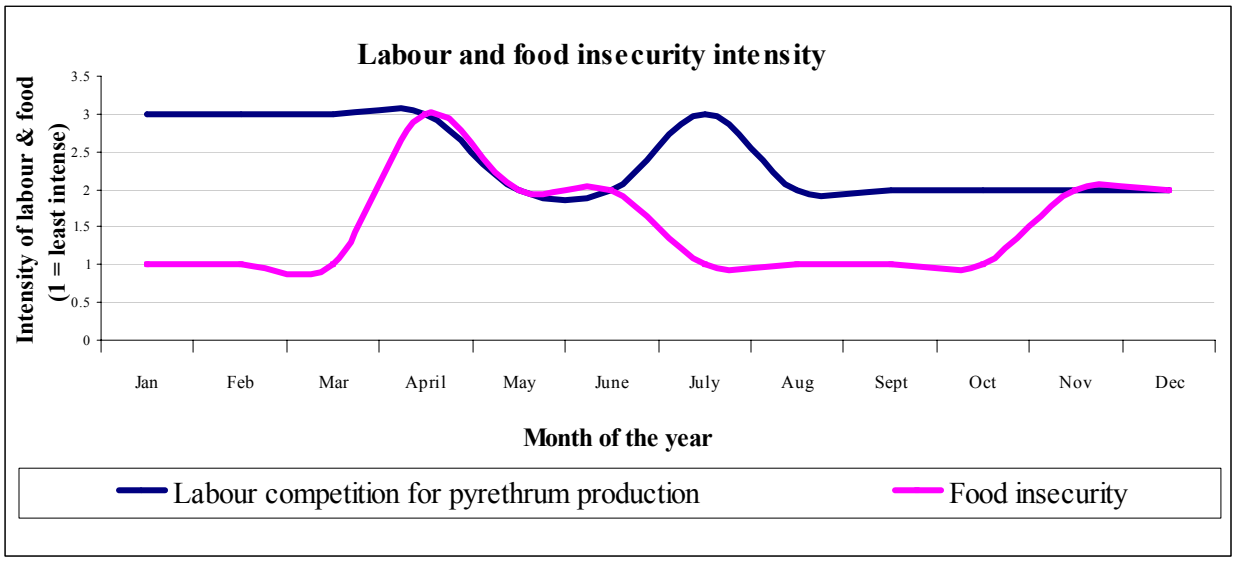

Figure 3. Labor requirements for pyrethrum production and food insecurity

Farmer perceptions of pyrethrum production

Sources of income used for pyrethrum production. The sale of farm produce is the primary source of income used to fund production. Other sources for the individual farmers were savings from hiring out labor (14.3%). The individuals who belonged to groups were benefiting from pyrethrum production through the group shares obtained from this activity (40%). The groups had diverse sources of funding that included the membership fees and Agro-Management (14.3%).

Uses of income from pyrethrum production. The income from pyrethrum was useful in solving the medium-term cash requirements such as buying land or paying school fees.

Constraints. Half (52.6%) the respondents reported that the main difficulty associated with the production of pyrethrum was its labor-intensive nature. One-fourth (27.2%) reported that there was a lack of market. When farmers were asked where else pyrethrum could be sold apart from Agro-Management, most of them did not know. According to one farmer, at one time Rwandan pyrethrum growers were selling their production to Ugandan farmers so that they could in turn sell this produce to Agro-Management. One farmer reported that income was low in comparison to the production requirements. When asked what price they would like pyrethrum to be sold at, 63.2% (n=19) mentioned a price ranging from 3,000 kg^{-1} - 4,000 kg^{-1} Ug Shs. About 21.1% reported that they would like it to be sold at 5,000 kg^{-1}, whilst 15.8% said that it could remain at the current price of 2,700 kg^{-1}.

Suggestions for improvements. The suggestions provided for increasing production included the timely payment of farmers and the provision of alternative markets. Farmers still had an interest in pyrethrum production (47% and 36.8% respectively). One-third (36.8%) of the farmers reported that Agro-Management should provide inputs and had become dependant on Agro-Management for them.

Economic evaluation of pyrethrum production

Experimental farmers. The Karambo Tukore group did not weigh the produce from each experimental plot resulting in the failure to compute the returns to their production. Although farmers were to incur the costs of land leasing, labor and the equipment for pest and disease management, they said that the land that was allocated to pyrethrum production was abandoned so there were no leasing costs. These farmers also used the group's labor to conduct all the experimental activities; hence they would not cost their labor. The opportunity cost of labor was therefore used in this study. All the experimental treatments produced financial losses owing to very low yields per plot (Table 2.).

Table 2. Partial budget analysis for Muguli B Turwanise Obworo experimental group.

	Costs (Uganda Shillings/acre)					Returns (Uganda Shillings/acre)	
Treatment	Labor	Non-labor	Partners	Farmers Facilitated	Total Costs	Returns	Net Returns
1.7 kg TSP + 20 b[92] of marc	1,016,000	857,200	856,200	1,017,000	1,873,200	216,000	-801,000
100 kg lime	1,016,000	1,669,200	1,668,200	1,017,000	2,685,200	907,200	-109,800
1.7 kg TSP +20 b of FYM	1,016,000	1,617,200	816,200	1,017,000	1,833,200	842,400	-174,600
3 kg TSP	1,016,000	869,200	868,200	1,017,000	1,885,200	399,600	-617,400
Control 1	1,016,000	749,200	748,200	1,017,000	1,765,200	248,400	-768,600
20 b of ash +1.7 kg TSP	1,016,000	1,217,200	816,200	1,017,000	1,833,200	151,200	-865,800
1.7 kg +100 kg lime	1,016,000	1,737,200	1,736,200	1,017,000	1,753,200	302,400	-714,600
0.6 kg NPK	1,016,000	770,800	748,200	1,017,000	1,765,200	972,000	-45,000
40 b marc	1,016,000	829,200	828,200	1,017,000	1,845,200	432,000	-585,000
20 b FYM	1,016,000	1,549,200	1,548,200	1,017,000	2,565,200	421,200	-595,800
20 b ash	1,016,000	1,149,200	1,148,200	1,017,000	1,165,200	388,800	-628,200
Control 2	1,016,000	749,200	748,200	1,017,000	1,765,200	831,600	-185,400

The first year of pyrethrum production for experimenters was characterized by low plant vigor, weed infestation (e.g., coach grass) and lack of knowledge on how to implement conservation practices. In addition to poor weather conditions, late planting in the dry season exacerbated poor yields, leading to premature drying of the flowers. Pruning as a recommended practice was not being conducted. The stalk is removed when the flower was harvested, done concurrently with

[92] b=Basins and each basin is equivalent to 5 kilograms of material.

weeding. Pruning is also done on the whole crop after three years. This is a cheaper alternative to replanting the field.

The highest yield was about 360 kg acre^{-1} in the 0.6 kg NPK treatment, which was far less than the expected yields. On average, about 80 kg month^{-1} of dry pyrethrum would be expected from an acre (2 kg/100m^2 mo^{-1}). In most cases the ratio of the nonlabor to the labor costs was less than one. The nonlabor costs were higher in cases where FYM, ash and marc were applied because large amounts were required for a unit increase in nutrient replenishment.

The ratio of the nonlabor to the labor costs was less than one, being higher in cases where FYM, ash and marc were applied because large amounts were required for a unit increase in nutrient replenishment. These treatments had high costs as a consequence of the labor input required to acquire and transport this fertilizer from the source to the field. The results of the 0.6 kg NPK treatment were better than all others (Ug Shs –45,000) attributed to the associated high returns (Ug Shs 972,000), which offset the production costs, coupled with low input costs of this treatment. The other treatments with manageable losses included the farmers' practice (control 2), 100 kg lime, and 1.7 kg TSP + 20 basins of FYM. These all had returns of between 831,600 and 907,200 Ug Shs.

The Agro-Management-supported farmers

Group growers

Three farmers (Respondents 9, 13 and 16) with an acre or less of land had profits of 794,400; 961,000 and 2,671,000 Ug Shs, respectively, owing to their higher and more consistent yields (Table 3). Respondent 16 had high returns due to high yields over a three-year period compared to 9 and 13, who initially produced low and then bumper harvests over a two-year period.

Table 3. Partial budget analysis for the group growers of pyrethrum.

Respondent	Acre	Costs (Uganda Shillings)			Returns (Uganda Shillings)	
		Labor	Agro-Management	Farmers	Returns	Net Returns
9	0.25	24,000	339,600	48,000	842,400	794,400
10	3	405,000	4,064,700	582,000	1,134,000	552,000
11	1	96,000	1,336,400	120,000	97,200	-22,800
12	0.25	24,000	332,100	48,000	54,000	6,000
13	0.6	57,000	804,440	86,600	1,047,600	961,000
14	0.5	48,000	670,200	72,000	27,000	-45,000
16	1	96,000	1,884,000	137,000	2,808,000	2,671,000

The farmer with three acres had a slightly lower profit of 552,000 Ug Shs due to higher costs incurred from the land size. Respondents 11 and 14 had negative returns because the net returns were not high enough to offset production costs. Individual growers produced lower yields than the group growers. However, 71.4% individual farmers made profits, provided Agro-Management continues to provide nonlabour inputs, and no opportunity costs were attached to family labor.

Individual growers

Most individual farmers had less than an acre of land, except for two farmers who had about 1 acre land thus confirming that the farmers were conducting growing the crop on a trial basis (Table 4).

Table 4. Partial budget analysis for the individual pyrethrum growers.

Respondent	Acre	Costs (Uganda Shillings)			Returns (Uganda Shillings)	
		Labor	Agro-Management	Farmers	Returns	Net Returns
3	0.5	75,000	475,400	113,000	135,000	22,000
4	0.75	113,000	1,144,200	161,000	1,155,600	994,600
5	0.33	42,500	312,384	69,200	0	-69,200
15	0.5	75,300	491,400	114,300	97,200	-17,100
17	0.4	66,500	376,920	95,500	162,000	66,500
18	1	96,500	908,600	130,500	162,000	31,500
19	1.3	138,500	1,239,240	201,500	294,840	93,340

Most (71.4%) of the individual respondents owned the land by freehold or customary ownership compared to the group growers, of whom the same number owned the land by leasehold, future access to land uncertain. The highest profit was received by respondent 4 (Ug Shs 994,600), who produced progressively increasing quantities of pyrethrum for the first 3 years from the year 2000. During the fourth year, however, the yield declined, probably due to production at the diminishing returns level. The crop either needs to be replanted or pruned to generate new growth. In general the low profits resulted from inconsistent production, where farmers got yields for only one year. The main reason given for this inconsistent production was that most of the crop had dried out and/or was abandoned. As a result, the reported yields were 0 for other years.

Only five farmers in the survey sample belonged to Agro-Management groups and had decided to plant their own pyrethrum crop (Table 5). It was hypothesized that they had learned the production practices in the group; but as the returns to the individuals belonging to the group was much lower, they decided to produce pyrethrum on their own.

Individuals who belong to groups

Table 5. Partial budget analysis for the individual growers of pyrethrum who belong to groups.

Respondent	Acre	Costs (Uganda Shillings)			Returns (Uganda Shillings)	
		Labor	Agro-Management	Farmers	Returns	Net Returns
1	1	108,000	1,148,800	370,000	86,400	-283,600
2	1	108,000	1,148,800	370,000	81,000	-289,000
6	1	108,000	1,148,800	370,000	1,350	-368,650
7	0.25	27,000	250,200	46,500	388,800	342,300
8	0.5	42,000	461,400	54,000	810,000	756,000

All farmers in this survey reported that Agro-Management had visited their fields, which were an acre or less in size. As they owned land under freehold or customary ownership, they did not incur costs of land lease. These farmers incurred losses, resulting from yields as low as low as 0.5kg. The highest profits were got from Farmer no. 8, who had yields as high as 300 kg.

The profit of the individual farmers belonging to groups was higher than the individual growers. This had implications, however, because they had too many on-farm activities including food production, pyrethrum group and individual plot activities.

Agro-Management is the sole market for pyrethrum in Uganda. The over dependence on a monopoly market has provided farmers with invaluable experience in this process of market-oriented production. Agro-Management owes farmers large sums of money. This has demoralized farmers who have either abandoned or uprooted the crop. There is a need for these experimental farmers to select another enterprise crop due to the lack of market for their production. In Rubaya, instead of uprooting the crop, farmers intercropped pyrethrum with other crops such as peas. However, in the low-concentration area, pyrethrum land was abandoned or the crop uprooted.

Conclusions and recommendations

Pyrethrum production is on the decline. According to smallholder farmers, however, it is a high-paying crop, which provides a regular income that enables farmers to invest in short-term household needs. Nevertheless, pyrethrum production has high tradeoffs. It requires high labor and nonlabor input investment. Agro-Management has incurred the cost of nonlabor inputs, which has enabled farmers to accrue the higher profits at the cost of Agro-Management plus the fact that the processing plant is not operating to full capacity. Furthermore, the production of pyrethrum is complex; hence farmers cannot keep up with the management requirements.

General recommendations

- Pyrethrum production is profitable given that farmers adopt the culture of hiring labor for the majority of these production activities. This increases the efficiency with which each activity is done.
- To restrict production to smaller, more manageable areas, farmers should invest in the nonlabor costs.
- To reap economies of scale in terms of costs, groups should be encouraged to produce pyrethrum despite the lower returns to individual group members.

Recommendations for experimental growers

- Given permanent cessation of payment to the farmers, the experimental farmers should choose an alterative enterprise.
- If farmers continue the production, they should follow the recommended management practices. These farmers are forming the learning process of pyrethrum crop management and have gained a considerable amount of experience thus far.
- The use of locally available soil amendments is labor intensive because it requires substantial labor resources for transportation if applications are to be done at recommended levels.

Therefore, the integrated use of these amendments with inorganic sources of nutrients should be encouraged.

Recommendations for Agro-Management-supported groups and individuals

- The prices of pyrethrum are not competitive in light of the quality of Dalmatian chrysanthemums produced in the tropical belt.
- The pyrethrum market should be diversified. Agro-Management could work hand in hand with storekeepers or agricultural input supply shops to buy the product from them to reduce the incidence of nonpayment to the ordinary farmer.
- Agro-Management has ceased payment to farmers due to the reasons beyond their control. This being the case, farmers should cease the production of pyrethrum in favor of other crops.

ILAC Brief No. 5
Writing up Innovation Histories: A Useful Learning Tool.

Researches: Boru Douthwaite[93], Jacqueline Ashby[94]

Summary

We can only meaningfully understand the innovation processes that we are part of by contemplating the larger innovation system in which they take place. Constructing innovation histories is a way of making visible how our actions are interrelated to other people's actions in patterns of behaviour that are not isolated events. Recognizing and understanding these patterns can improve our performance in enabling rural innovation. In this Brief we describe how to construct and learn from innovation histories.

Rationale

Many research and development agencies want to enable rural innovation. But to enable innovation we need to understand how it happens, and these stories are rarely, if ever, written down. Innovation histories allow the people involved in the innovation process to reflect on what they did, and learn how to improve their performance in the future. If several innovation histories are recorded using a common framework then we can look for similarities and differences and discover general principles. This helps avoid repeating mistakes and helps us identify and use what works. This brief describes a methodology being developed at the International Center of Tropical Agriculture (CIAT) for recording and learning from innovation histories.

Who is the innovation history for?

The innovation history is first and foremost so the people involved in an innovation process can reflect on what they did, how their activities are interrelated to others actions and what they might do better in the future. The secondary purpose is for others to learn either from an individual case or by comparing and contrasting experiences across several innovation histories. This type of comparison is made easier if a common framework is used to construct the innovation histories.

Innovation is driven and thwarted by people and hence honest innovation histories can reveal conflicts, mistakes and problems that are very sensitive in nature. It is therefore very important that the people who are constructing the innovation history know that nothing they say will be made public outside of their group without their consent.

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Who constructs them?

In most cases the innovation history is constructed by an analyst who is both a kind of investigative journalist and facilitator of a discovery learning process. The key people involved in the innovation process participate in constructing the innovation history through the interviews they give and the feedback on the drafts produced.

What is the framework that guides data gathering and analysis?

We use two sets of concepts to guide data gathering and analysis. The first set derives from the Learning Selection model (Douthwaite, 2002, Douthwaite et al. 2001) which includes a normative view of the stages in an innovation process. The second set derives from social network analysis. We use InFlow software (www.orgnet.com) to draw and analyse the networks.

How to construct and innovation history and learn from it

This step-by-step guide is work in progress, based on our experience to date.

1. Clarify objectives for constructing the innovation history and the expectations of the main stakeholders involved

In our experience there are three main reasons for constructing an innovation history: 1) to produce publicity materials; 2) to learn from experience and draw lessons in order to improve programs; and 3) to carry out research on innovation processes, and publish. Expectations should be clarified at the beginning so that the analyst/facilitator does not produce something at the end that will not be used. Expectations can change through the process. For example, a project nominates their most successful innovation process because they want to raise its profile, but in the process find out that things are not going as well as they thought. Hence, their priority changes to wanting to use the findings to improve the program.

People's expectations about authorship should also be clarified at the beginning.

2. Decide what is the innovation

We began working on an innovation history of cassava mills in Colombia to find that the innovation was actually a whole package of ideas and technologies that would supply the cassava mills with sufficient raw material, process the cassava, and then market the output.

3. Construct an innovation timeline and actor network map

Innovation histories are narratives built on providing causal explanations for two outputs:

- An ***innovation timeline*** that lists the key events in the innovation history in the order they happened;
- ***Actor network maps*** that show the linkages between the stakeholders at two or more important stages in the process, so as to capture the dynamics of changing partnerships.

The timeline and network maps will develop and change during the process of explaining causality and the nature of the linkages.

Start with the most knowledgeable person, if possible the product champion and "snowball" from there by talking to key informants identified in previous interviews and from the literature. Start constructing an innovation timeline from the beginning. At the same time construct actor network maps.

For each event identified in the innovation timeline ask Who? Why? How? and with what results? Why? is the most important question because it gives insights into what motivates people to act the way they do.

4. Share the timeline and network map with key informants

Continue interviewing using the timeline and network maps as talking points. Make sure you talk to people from all the important stakeholders identified in the network maps.

If one of your objectives is learning and improving the program commissioning the case study, then our experience is to share these findings early and informally. For example, summaries of interviews can help the R&D team learn how the key stakeholders perceive the technology and the performance of the R&D team. Presentation of results in this way is less threatening than in a final, polished report. It also helps include the key informants in analysing and learning from the innovation history. It makes it more likely that the group commissioning the innovation will allow wider circulation of a frank discussion of what worked and what did not.

5. Write the innovation history narrative

Begin writing the innovation history narrative early because the process of explaining in writing what happened is a form of analysis and will help surface new questions. Share the narrative with key informants to check your explanation of causality, and the facts. Incorporate comments.

6. Write up the innovation history report

Ideally the key informants will be co-authors by this stage and so writing it will be an iterative process in which they participate. The box shows a recommended format for the report.

1. Introduction – describe motivation for the constructing the innovation history or histories and why innovation histories are useful.
2. Methodology – describe framework used and data gathering methods.
3. Case study or case studies (if more than one then each case study will be a separate chapter).
4. Discussion and Conclusions – discuss how the innovation history complied and differed from the normative view of the innovation process described in the learning selection model. Discuss the evolution of the network of actors associated with the innovation, and discuss ways in which the network could be strengthened.
5. Synthesis – if there is more that one innovation history then compare and contrast the main findings from each case study.

7. Hold workshop and promulgate findings

Depending on the findings and the budget it may be desirable to present the findings in such a way as to affect policy, at whatever scale. A workshop, journal paper and briefing notes are some of the possible outputs. The innovation history may become one in a portfolio of innovation histories that are analysed together.

Further reading

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Lessons learned from CIAL Innovation Histories in Colombia and Honduras

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Introduction

We are in the process of constructing innovation histories of CIALs in Colombia and Honduras, the two countries with the most CIALs, and the longest established second order organizations. The following are our interim findings, following the evaluation questions in the Kellogg-funded project under which much of the work on strengthening second order organizations of CIALs (ASOCIALs) has taken place.

Methodology

The methodology we are using is describe in Douthwaite et al. 2004[107]

What are the principles and practices that contribute to institutionally sustainable CIALs?

In summary:

- Institutionally sustainable CIALs are supported by an inter-linked network of organizations who enjoy mutually-beneficial relationships.
- The actions taken as part of this project to register the ASOCIALs in Honduras as legal entities and build their capacity to attract and manage projects on their own is helping to build the links that the ASOCIALs need for their long-term sustainability.
- However, as of 2003, those links were not yet sufficient and their remains a role for the host organizations to continue to seek funding.
- Long-term sustainability of the ASOCIALs requires them to be able to operate as small NGOs, being able to win projects and pay staff salaries.

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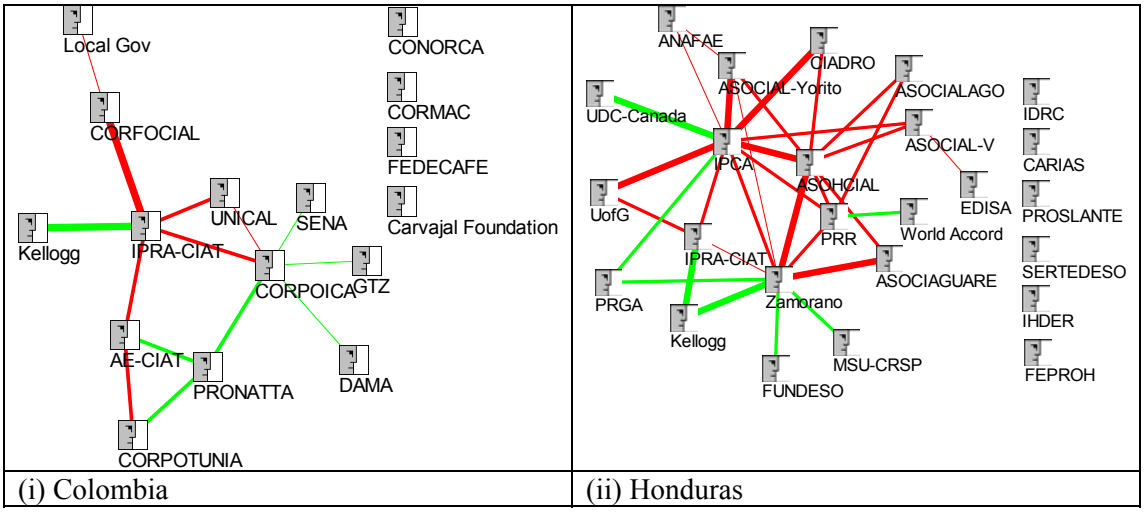
[101] Manager Corporación para el desarrollo de Tunía - CORPOTUNIA
[102] Director Consorcio Interinstitucional para una Agricultura Sostenible en Ladera - CIPASLA
[103] Leader – Asociación de Productores de Anturios de Ventanas - ANTUVENT
[104] Leader path Crucero del Rosario, Cauca, Colombia
[105] Guía CIAL – Corporación para el Fomento de los CIALs - CORFOCIAL
[106] Director – Corporación para el Fomento de los CIALs - CORFOCIAL
[107] Douthwaite, B.; Ashby, J. 2004. Constructing and Learning from Innovation Histories. In: CIAT (Centro Internacional de Agricultura Tropical). Annual Report, Participatory Research Project. Cali. 4p.

One of the approaches we used in the innovation history study was to carry out social network analysis to gain a better understanding of the sustainability of the networks working with CIALs in Colombia and Honduras. Figure 2 shows the networks maps for both countries in 2003. The program we used to draw and analyze the maps is called InFlow[TM108] which uses an algorithm to construct ego-centric networks, that is networks where the better connected and more powerful nodes are closer to the centre. Network power comes from being as few links as possible away from other nodes (high *closeness*), while at the same time being in a position where others need to pass through you to connect to other parts of the network (high *betweenness*)



(i) Colombia (ii) Honduras

Figure 2: Network map of organizations currently collaborating (red (dark) links) and funding (green (grey) links) work on CIALs in Honduras and Colombia in 2003

An important concept in network analysis is that efficient networks, whether they be the Internet, nervous systems of animals or innovation networks, share common properties. These properties are:

1. *Clustering* and *diversity* - though clusters form around common attributes and goals, vibrant networks maintain connections to diverse nodes and clusters. A diversity of connections is required to maximize innovation in the network.
2. Robust networks have several paths between any two nodes. If several nodes or links are damaged or removed, other pathways exist for uninterrupted information flow between the remaining nodes.
3. The *average path length*[109] in the network tends to be short without forcing direct connections between every node.

The Honduran network scores well with a clustering co-efficient of 0.51, and an average path length of 2.32. According to Valdis Krebs, who wrote the Inflow software and has analysed many networks, an efficient network has a clustering coefficient of 0.5 to 0.6 and an average

[108] www.orgnet.com

[109] The average path length in a network is a convenient measure of the network's efficiency. The longer the average path length, the longer it takes for messages to travel between any two nodes, and the more distorted they are when they arrive.

path length of 3 or less, hence the Honduran network scores on both counts. The Colombian network in 2003 had a clustering co-efficient of just 0.24, indicating a lack of clustering, and a path-length of 2.33, which is long for such a small network. Visual comparison of the two networks shows that the Honduran network does have multiple links between partners, much more so than the Colombian network. The practical benefit of having a number of links was demonstrated when FEPROH stopped working with the ASOCIAL-Vallecillos and its CIALs in 2000. ASOCIAL-Vallecillos also had a link to IPCA and that subsequently strengthened, keeping ASOCIAL-Vallecillos in the network, and keeping support going to its CIALs.
The idea that the Colombian CIAL network is weaker than the Honduran one is supported by the fact that the number of CIALs in Colombia has been falling since 1999 while it has been rising in Honduras since 2000 (see Figure 3). An interesting question is why this is so, given that IPRA-CIAT is based in Colombia. One reason is that CORFOCIAL did not sustain the same level of support from this project as did the ASOCIALs in Honduras. A second factor that CORFOCIAL has much fewer links to other organizations than the ASOCIALs in Honduras. Finally, the institutionalisation of the CIAL approach in CORPOICA did not survive the loss of project funding, for reasons that we discuss later.

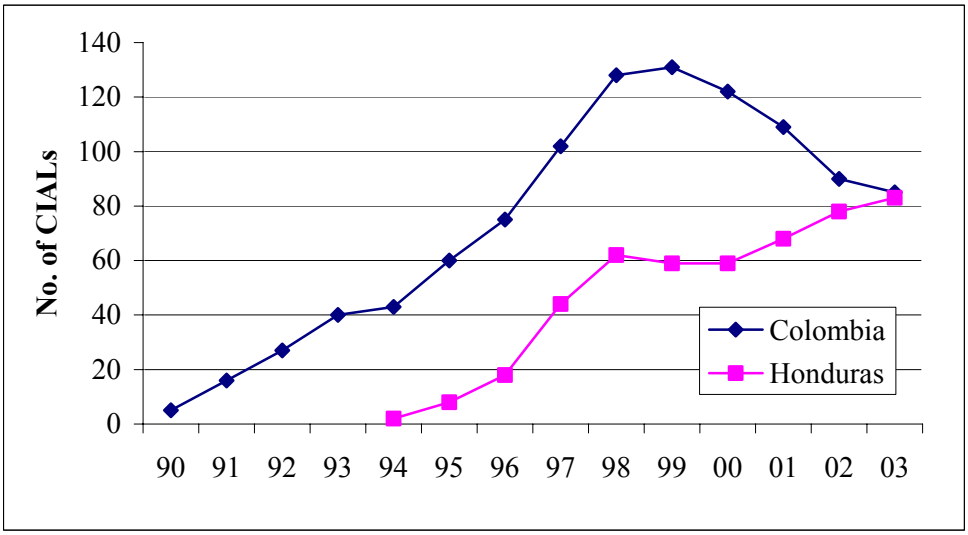


Figure 3. The number of CIALs in Colombia and Honduras

Although the Honduran network is currently strong, it would be seriously weakened if IPCA or Zamorano withdrew, as is probable sometime in the future, either to pursue other research and development objectives or because of a failure to find funding for the work. The latter becomes increasingly likely as donors like eventually to fund new initiatives. Network theory says that to help prevent such major disruption the ASOCIALs and ASOHCIAL need to be making their own links to other organizations and donors, independent of IPCA and Zamorano. This is exactly what tecniCIAL and IPRA-CIAT have been training the ASOCIALs and ASOHCIAL to do, and also reflects the priorities of the ASOCIALs themselves to gain the legal status required to manage funds, for training in writing project proposals as well as having their own office and transport. The innovation history in Honduras shows that the training provided to the ASOCIALs, largely by the host organizations, has been most impressive. The ASOCIAGUARE

members, for example, attended eight workshops between 2001 and 2003, in addition to an exchange visit with ASOCIAL Yorito. Nevertheless, the very low recognition by CIALs of ASOCIAGUARE and ASOCIAL-Yorito in comparison to Zamorano and IPCA in an organizational mapping exercise (see Table 5) suggests that as of 2003, IPCA and Zamorano remain the *de facto* second order organizations.

The ASOCIALs recognise that their sustainability will require them to move from being essentially voluntary organizations, as they are now, to become small NGOs that can win sufficient funding to pay salaries, or organizations that provide business and other services. Unless this happens, ASOCIAL members will likely take their new skills and go and work for NGOs and other types of organization who *can* pay them salaries.

How have CIAL associations influenced local decision-makers and local development agendas?
In summary:

- CIAL and ASOCIAL members are linked on average to seven organizations within their respective communities, and six organizations outside. Through these linkages CIAL members are undoubtedly influencing local decision-makers and local development agendas.

What the network maps in Figure 2 do not show are the links that CIAL and ASOCIAL members have with other organizations not directly working with CIALs. This information was collected in Honduras in 2003 during organization mapping exercises carried out by TecniCIAL and the ASOCIALs. We analyzed these results for ASOCIAGUARE and ASOCIAL-Vallecillos (Table 5). The twelve CIALs surveyed in the ASOCIAGUARE area were working with a total of 61 organizations while seven CIALs in the ASOCIAL-Vallecillos area were working with 37 organizations. The external organizations include local municipalities. According to IPCA research "a key characteristic of CIAL members is that they are 'joiners'"[110], meaning that CIAL members are also likely to be active members of other organizations. Their influence in these organizations means that the experiences coming from the CIALs will inevitably be influencing local decision-makers and local development agendas.

Table 4: The average and total number of organizations, both internal and external to the community, that CIALs represented by ASOCIAGUARE and ASOCIAL-Vallecillos have links to.

		ASOCIAGUARE	ASOCIAL-Vallecillos
Internal organizations	Average per CIAL	7.1	6.9
	Total for all CIALs	27	21
External organizations	Average per CIAL	6.2	6.7
	Total for all CIALs	34	17
No. of CIALs surveyed		12	7

[110] Humphries et al. (2000)

Table 5. The organizations most commonly linked to CIALs in the areas covered by ASOCIOGUARE and ASOCIAL-Vallecillos

(i) Organizations internal to the community

ASOCIOGUARE	
Organization	f
Patronato	12
Iglesia Católica	10
Junta de Agua	9
Iglesia Evangélica	8
Sociedad de padres de familia	8
Equipo de Fútbol	7
Caja Rural	4

ASOCIAL-Vallecillos	
Organization	f
Patronato	7
Junta de Agua	7
Sociedad de padres de familia	7
Iglesia Católica	6
Equipo de Fútbol	3
Comité de Salud	3
Iglesia Evangélica	2

(ii) Organizations external to the community

ASOCIOGUARE	
Organization	f
Zamorano	12
Municipalidad	8
PRODERCO	6
Plan Internacional	4
SANAA	3
COHDEFOR	3
Ministerio de educación	3
FHIS	3

ASOCIAL-Vallecillos	
Organization	f
Municipalidad	7
EDISA	7
IPCA	6
IHCAFE	4
PRAF	3
CEPROD	3
AHPROCAFE	3
PRONADEL	3

How effective are CIAL associations in establishing mutual beneficial relationships with formal R&D organizations?

In summary:

- ASOCIALS have been most successful in establishing relationships with R&D organizations when those organizations have a mandate to carry out local adaptive research and implement development projects.
- The sustainability of these relationships depends on the ability of the R&D organization to help support the CIALs and ASOCIALs through project funding.
- Sustainability of the relationship is also helped if both the research and development / extension parts of the R&D organization champion working with CIALs.

The best example of communication between CIALs, an ASOCIAL and a research organization that emerged in our innovation history study is between ASOCIAGUARE, its CIALs, and the Panamerican Agricultural School in Zamorano. ASOCIAGUARE has helped, or is helping Zamorano implement a FUNDESO-funded project on irrigation for dry-season farming, two participatory plant breeding projects on beans and maize funded by PRGA and the Norwegian Government respectively, and a project with the Michigan State University funded by the USAID-funded Collaborative Research Support Program (CRSP). In turn ASOCIAGUARE and its members have received help in running the first regional CIAL meeting outside of Zamorano, drip irrigation has been set up in at least one CIAL and have participated in numerous trainings.

More importantly, the knowledge made available by, and generated within, these projects helps improve agriculture in the CIAL communities. This is truly a mutually beneficial, and stable, relationship. Indeed, such is the value that Zamorano places on ASOCIALGUARE that the Rector of Zamorano visited the association in 2003.

A second example of a beneficial relationship is between ASOCIAL-Yorito, FIPAH and the Department of Sociology and Anthropology at the University of Guelph. The FIPAH Co-ordinator, Dr. Sally Humphries is an associate professor in the department, and several of her students have carried out their field work, hosted by FIPAH and the ASOCIAL-Yorito. This relationship helped FIPAH secure funding from a charitable foundation called USC/Canada. FIPAH employs three Honduran staff who have played *the* major role in supporting and training the ASOCIALs and CIALs. These staff retain important links with CURLA, the north-coast campus of the national university in Honduras.[111]

A third example has been CORPOICA[112], the Colombian National Research Corporation, who announced in 2000 that they were institutionalizing the CIAL method within the organization. CORPOICA established a total of 75 CIALs of which 48 were still active in 2002. CORPOICA also set up a second-order organization called UNICAL representing 8 CIALs in the Cundiboyacense Plateau in Colombia. Unfortunately, however, CORPOICA has largely stopped providing support to its CIALs in mid 2003 when project funding finished.[113], showing that despite good results, CIALs are not institutionalized in CORPOICA. One explanation is that the CIALs were championed by the extension wing of CORPOICA which was never able to sell the idea to the research wing.

CORFOCIAL, the main second order organization in Colombia, has close links to CIAT, and helps both IPRA and the CIAT Bean Project carry out research. However, the CIAT - CORFOCIAL relationship is not as close as that between Zamorano and ASOCIOGUARE. Part of the reason is that the true value of CIALs comes from delivering both research and development outcomes and this matches well with Zamorano who has a mandate to carry out research as well as local development work. CIAT, on the other hand, is an international organization with a mandate to carry out research leading to international public goods. Developing the CIAL method fits well with CIAT's mandate but carrying out location specific research with lots of CIALs fits less well.

Which self-financing mechanisms are most effective in contributing to sustainability of CIALs and CIAL associations?
In summary:

- By far the most important self-financing mechanism is income from projects that support the ASOCIALs to deliver research and development outcomes.
- Other types of self-financing mechanism contribute less than 5% of the estimated full cost of running an ASOCIAL.

[111] Centro Universitario Regional del Litoral Atlántico
[112] Corporacion Colombiana de Investigación Agropecuaria
[113] Personal communication with Luis Humberto Fierro, 2004

- The long-term sustainability of ASOCIALs and CIALs will depend on ASOCIALs being able to write and win funding for project proposals. In effect, ASOCIALs need to become successful small NGOs.

ASOCIOGUARE estimate that running an ASOCIAL with 15 members costs about $20,000 per year[114] Most of this cost represents the time and travel expenses of the facilitators, as Table 6 shows. In Honduras most of this has been borne by the host organizations. TecniCIAL, the group of facilitators working for the host organizations in Honduras (at present, FIPAH, Zamorano and PRR), have been training local CIAL 'promoters' to take over much of the facilitation work. This will reduce cost somewhat but salary bills will remain high if the ASOCIAL members themselves are to receive a salary. ASOCIALs and CIALs have been engaging in a number of income generating activities that were listed and described in the January 2004 end of year report. In summary these approaches are:

- Selling the harvest from production plots, often as seed. For example, in one of the more ambitious schemes ASOCIOGUARE received a gross income of about $700 in one year[115]
- Charging regular or one-off membership fees. For example, ASOCIOGUARE charge about $10 per CIAL per year.
- Interest from savings. FIPAH has invested $25,000 of unspent project money since 2000, the interest from which is channelled through the ASOCIALs to help pay for the CIAL experimental fund (caja chica). This amounted to about $220 for ASOCIOGUARE in 2002.
- Profit from running a credit schemes. The ASOCIALs in Honduras received $1250 each in 2000 from the same unspent project funds. Income from this is less than $100 per year.
- Setting up a small agro-enterprise. In this case the profits often stay with the CIAL who may or may not continue to do research on behalf of their communities.

These self-financing mechanisms provide less than 5% of the estimated annual running cost of ASOCIOGUARE. For ASOCIALs to survive independently of their host organizations, they will need to be able to sell their services to help implement research and development projects.

[114] Based on a project proposal submitted by ASOCIOGUARE to IPRA in 2003.
[115] ASOHCIAL, 2003

Table 6. Number of CIALs per ASOCIAL in 2003 in Colombia and Honduras and the annual cost for facilitating them

ASOCIAL	Number of CIALS	Annual cost of facilitation ($)[116]
Colombia		
CORFOCIAL	35	17,500
Honduras		
ASOCIAL - Yorito	28	22,400
ASOCIAGUARE	15	12,000
ASOCIALAGO	15	12,000
ASOCIAL - Vallecillos	12	9,600
CIADRO	10	8,000

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Humphries, S. J. Gonzales, J. Jimenez and F. Sierra. 2000. Searching for sustainable land use practices in Honduras: Lessons for a programme of participatory research with hillside farmers. AgREN Network Paper No. 104

[116] Based on costs from Humphries et al. (2000) that a CIAL costs $500 per year to facilitate in Colombia and $800 in Honduras.

Impact Assessment of Local Agricultural Research Committees (CIALs) in Colombia

Researchers: Susan Kaaria,[117] Nina Lilja,[118] Fernando Hincapié,[119] James García,[120] Viviana Sandoval[121]

Collaborators: F. Sánchez

Milestones

- Methodology for conducting impact assessment of PR methods on livelihoods
- Impact of CIAL methodology on rural livelihoods in at least 4 communities with CIALs in Cauca Province

Abstract

For the last 13 years, the IPRA Project at CIAT has promoted the formation of community-based research services called Local Agricultural Research Committees (CIALs). With this study the IPRA Project seeks to evaluate the changes in the livelihoods of the farmers and their communities, attributable to the CIAL methodology. The CIAL methodology was developed at CIAT with the goal of increasing the efficiency of the agricultural research and technology development system by integrating farmers better into the process. The study will assess the effectiveness of the CIAL methodology, the extent to which the problems addressed by the CIAL are relevant to the community, the costs and benefits of the CIAL to its members as well as to the community in terms of the development of appropriate technologies and who benefits from the innovations. The extent to which CIALs affect the rate and level of adoption of agricultural technologies among socially differentiated user groups and the costs associated with forming and supporting a CIAL will also be studied. It will also examine how farmer participation in the agricultural research process affects the process itself, as well as the specific communities and individuals involved. Particular attention will be paid to how CIALs as institutional innovations affect the human, social and other capital assets available to individuals and communities, and what implications these impacts have for livelihood outcomes. This study involved 13 CIALs: focus group discussions were held in all of them, and in 6, formal interviews were conducted. In addition, four rural communities without CIALs (comparative communities) were also surveyed.

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Introduction

Over the past decades, agricultural research has contributed to significant increases in world food production. Maintaining these productivity increases, as well as making progress on additional goals of alleviating poverty and protecting the environment, presents a major challenge to the agricultural research system. In order to maintain and extend the benefits of agricultural research, new ways of doing research may be necessary. One such method, participatory research (PR), seeks to involve the intended beneficiaries of research in the research process itself, based on the idea that user participation will lead to more efficient and effective design and targeting of technologies, thereby reducing diffusion time and helping ensure that the intended beneficiaries are reached with technologies suited to their needs.

In principle, the concept of PR has been widely accepted. Few scientists would consider doing adaptive research on agricultural or natural resource management technology development without at least some input from users. There are many types and degrees of participation, however, with very different implications for the costs-benefits of research. For example, asking farmers' opinions or inviting them to visit field trials is a type of participation; however it is very different from letting farmers make decisions about what kinds of technologies will be developed or training them to carry out research themselves. Because PR methods incorporate user perspectives in the research process, it is often claimed that they orient research more towards the needs of the poor and thus result in a greater impact on poverty alleviation than conventional research. It cannot be said a priori that participatory methods make research more pro-poor because this would depend on the extent to which the needs and priorities of the poor differ from those of the nonpoor, and whether or not the poor are specifically targeted in the research process.

Whether PR makes research more pro-poor is essentially an empirical question. Therefore, in order to understand the relationship between PR and poverty alleviation better, empirical evidence is needed on what impacts participatory methods have had on poverty in the context of specific projects and participatory methodologies. This project seeks to begin to fill this gap. The study builds on results from an earlier study (Hincapié, 2003) and a survey done by the IPRA Project in 1998 (Ashby and García, 2000).

Methodology

This study examines the impact of one particular method of incorporating farmer participation, which is based on the establishment of local agricultural research committees (CIALs) in rural communities. This method was developed at CIAT in the 1990s and is currently used in approximately 250 communities of several Latin American countries. The CIAL methodology is based on the establishment of a research committee with elected members. Each CIAL is supported by an agronomist or extension agent who trains the committee members in the research design (controls, replicates, systematic evaluation of results) and who visits their trials regularly to provide technical support. Support for the agronomist comes from the institution supporting the CIAL, usually an NGO, the national research or extension service, or some other institution involved in technology development and transfer. Costs of experimentation are covered by outside funds; however farmers are not paid for their participation or time. Research

problems and priorities are set at the level of the community (by vote), but the experimentation is done by the CIAL on behalf of the community. Community members are able to visit the trials all along, and results of experiments are disseminated at the level of the community. If a series of experiments identifies a promising technology or practice, the CIAL will recommend it officially. In Cauca Province, 39 CIALs have been formed over the last 13 years by men and women farmers. They are supported by a second-order association—Corporation for the Development of the CIALs (CORFOCIAL)—while the IPRA Project at CIAT provides technical backstopping.

The sample design

The study was made taking in count both levels: community with and without CIALs, and CIALs.

CIAL level: The sample was selected from all existing CIALs in Cauca that are more than 5 years old and where it is considered safe to travel. To ensure a representative sample, CIALs were also stratified by age and gender of membership. Thirteen CIALs in 12 communities in Cauca were selected. At the CIAL level, individual household interviews were conducted, and FGDs (focus group discussions) were conducted at the CIAL group level.

CIAL communities: In order to understand the impact of CIALs on individual members as well as on other community members, individual household interviews were conducted in six CIAL communities and four communities without CIALs. In each of these communities both CIAL and non-CIAL members were interviewed. In addition, both the male and female heads of household were interviewed.

To define the sample for individual household interviews, a 10% margin of error and a 95% level of confidence were used in a randomly stratified design, in which the rural communities constituted the subpopulations that form the strata. The distribution of the selected sample is presented. The size of the sample for the rural communities without CIALs was determined as was done for the rural communities with CIALs.

Four of them (El Jardín, San Bosco, Tres Cruces and Cinco Días) were selected because they formed part of the study documenting the impact of the CIAL methodology (Hincapié, 2003), while the other two (Crucero de Pescador and Carpintero) had been in the impact study conducted in 1998. The information from these earlier studies formed the basis for the design of the surveys for this study.

Non-CIAL communities: In order to control for changes in the communities attributable to the presence of CIALs, 4 counterfactual communities were also selected on the basis of not being neighbors and similarity in various characteristics.

Study objectives

- ✓ Assess the effectiveness of the CIAL methodology
- ✓ Assess the costs and benefits of the CIAL to its members as well as the members of the community
- ✓ Use the results of this impact study actively for institutional learning and change.

Research questions

- ✓ How effective is the CIAL methodology?
- ✓ What are the benefits of being a CIAL member?
- ✓ How have the CIALs benefited their communities?
- ✓ What are the costs associated with CIALs?
- ✓ How can the results of this impact study be used for institutional learning and change?

Partial results of the study

Characterization of the CIAL members

The objective of this characterization is to learn the differences between the members and nonmembers of the Committees within the CIAL communities through the analyses of some socioeconomic indicators. The following are the research questions:

- ✓ Who are the CIAL members?
- ✓ Are the CIAL members representative of the community?

The answers to these questions will be obtained through the possible relationships between the members and non-CIAL members and the following socioeconomic indicators: Amount of own land, if they work off the farm or not, schooling, generation of employment (work days hired during the year), yearly availability of food and participation with community organizations.

Table 1 gives the relation between land tenure and the members and non-CIAL members. It can be observed that 41.6% of the farmers have property whose area is less than 1 ha, whereas 32.4% have areas that range from 1-3 ha.

Table 1. Comparison between members and non-CIAL members in relation to land tenure.

CIAL Members	Amount of Land (ha)				Total
	< 1	1 - 3	3 - 5	> 5	
No	60 43.8%	44 32.1%	15 10.9%	18 13.1%	**137**
Yes	12 33.3%	12 33.3%	6 16.7%	6 16.7%	**36**
Total	**72** **41.6%**	**56** **32.4%**	**21** **12.1%**	**24** **13.9%**	**173**

The foregoing implies that a small percentage of the farmers (26%) have land over 3 ha, which in accordance with the nature of their exploitations (coffee, common beans and maize) makes them small farmers.

Table 1 also shows that among the CIAL members, the percentages of land tenure are similar for the smaller sized properties: about 33.3% have less than 1 ha or from 1-3 ha. For the larger properties, 16.7% have 3-5 ha or more than 5 ha, which means that all types of farmers have free access to the CIAL, independent of the size of land that they have. Whereas in the non-CIAL members the proportion is greater in those that have less than 1 ha (43.8%). The foregoing means that there is a slight tendency for the farmers with less land to be less interested in belonging to a CIAL.

Table 2. Percent comparison between members and non-CIAL members in relation to land tenure and day labor.

CIAL Members	Work Off the Farm	Amount of Land (ha)				Total
		< 1	1 - 3	3 - 5	> 5	
No	No	26.3	23.4	7.3	11.7	**68.6**
	Yes	17.5	8.8	3.6	1.5	**31.4**
	Total	**43.8**	**32.1**	**10.9**	**13.1**	**100**
Yes	No	22.2	22.2	11.1	16.7	**72.2**
	Yes	11.1	11.1	5.6	0.0	**27.8**
	Total	**33.3**	**33.3**	**16.7**	**16.7**	**100**

In accordance with Table 2 on the relation between day labor and amount of land, we can see that the majority of the farmers do not recur to working on other farms, which implies that they are able to derive their livelihoods from their exploitations. The group of farmers that recur to day labor are those whose lands are under 3 ha.

If we compare members and non-CIAL members, we can see that there is no major difference in relation to the amount of land and day labor. The majority of both the members and the non-CIAL members (66.6 and 75.9%, respectively) had areas of land under 3 ha. Similarly, with regard to working off the farm, 72.2 and 68.6% of the members and non-CIAL members, respectively, do not do so. In accordance with the foregoing, there is not a significant level of dependency of the members and non-CIAL members with respect to the area available and the criterion of seeking day work.

Table 3. Comparison between members and non-CIAL members in relation to the generation of employment (work days/year)

CIAL Members	Generation of Employment (Work Days/Year)			Total
	Does not hire	1 - 6	6 – 12	
No	72 52.6%	59 43.1%	6 4.4%	**137**
Yes	9 25.0%	19 52.8%	8 22.2%	**36**
Total	**81** **46.8%**	**78** **45.1%**	**14** **8.1%**	**173**

Table 3 compares the total months contracted in the year 2003, observing that 75% of the CIAL members recur to labor during some time of the year, which contrasts significantly with the nonmembers, 47.5% of whom generated employment during the same period of time. This could be because there is a larger group of farmers not belonging to the CIAL that have less than 1 ha, who use all their labor on their land while the CIAL members, who are generating new technologies and greater intensification in land use, need to hire labor as they cannot manage all that work.

Table 4. Comparison between members and non-CIAL members in relation to scarcity of food in the year.

CIAL Members	Scarcity of Food (mo/yr)				Total
	Not scarce	< 3	3 – 6	> 6	
No	20 14.6%	80 58.4%	32 23.4%	5 3.6%	**137**
Yes	11 30.6%	12 33.3%	11 30.6%	2 5.6%	**36**
Total	**31** **17.9%**	**92** **53.2%**	**43** **24.9%**	**7** **4.0%**	**173**

Table 4 contrasts the total months in which there was scarcity of food in 2003 between the members and non-CIAL members. In general terms and independent of whether they were members or not of the CIAL, it was observed that at a certain time of the year, there was a scarcity of food and the greatest percent was in the range of less than three months when food availability was low.

Comparing the two groups, 30.6% of the CIAL members vs 14.6% of the nonmembers stated that there was no scarcity of food, which could indicate the benefit of the CIAL methodology, which focuses primarily on crops that are important staples in the region such as common beans and maize. The rest (85.4% of the nonmembers vs 69.4% of the members) stated that during some time of the year, there was insufficient food, which affected the quality of life of the community, those belonging to the CIAL being less affected.

Table 5 compares the levels of schooling between the members and non-CIAL members, observing that at least 76.3% of the farmers in general had a primary education; only 8.8% had reached the level of secondary education. Comparing the levels of education within the CIAL and non-CIAL groups, it can be seen that the former had the lower level of illiteracy (2.8 vs 12.4%) and the higher level of schooling (30.6 vs 8.8%).

Table 5. Comparison between members and non-CIAL members in relation to schooling.

CIAL Members	Schooling			Total
	No Education	Primary	Secondary	
No	17 12.4%	108 78.8%	12 8.8%	**137**
Yes	1 2.8%	24 66.7%	11 30.6%	**36**
Total	**18** **10.4%**	**132** **76.3%**	**23** **13.3%**	**173**

Given the foregoing, it could be inferred that the farmers that are CIAL members have the higher levels of schooling. This does not constitute an indispensable requisite for being part of this group, but it does give them some qualities that enable them to hold posts within the Committee or in the different community organizations. Figure 1 supports this, where we see a greater commitment with respect to participation in number of organizations, among those farmers that have had a higher level of schooling.

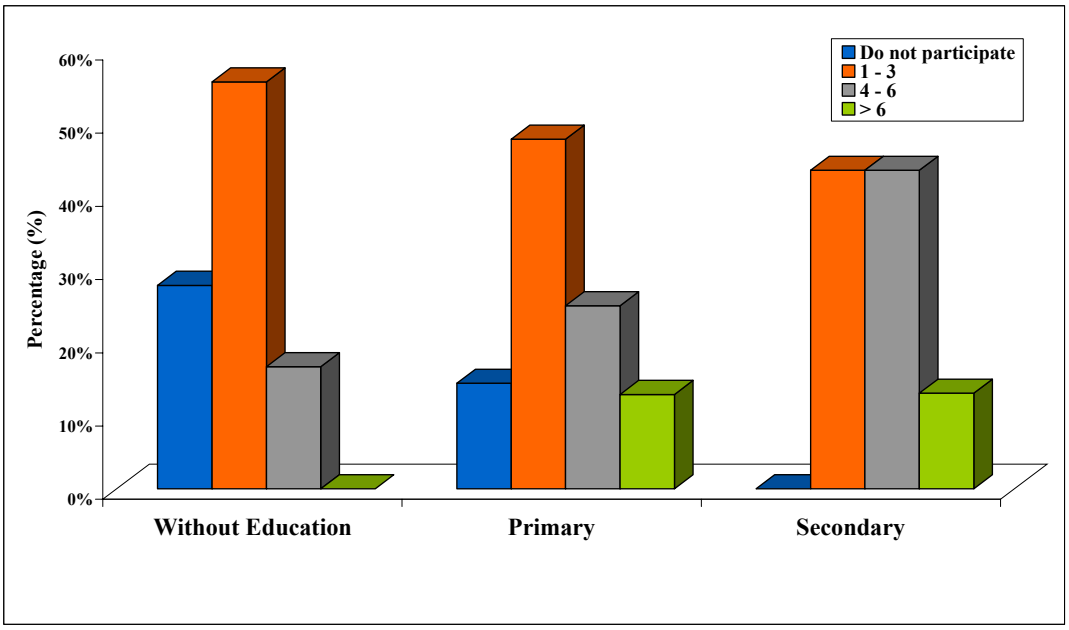

Figure 1. Comparison between schooling and the number of organizations participating.

Table 6. Comparison between members and non-CIAL members in relation to the number of community organizations in which they participate.

CIAL Members	No. of Organizations				Total
	Does Not Participate	1 – 3	4 - 6	> 6	
No	23 16.8%	71 51.8%	33 24.1%	10 7.3%	**137**
Yes	1 2.8%	12 33.3%	13 36.1%	10 27.8%	**36**
Total	**24** **13.9%**	**83** **48.0%**	**46** **26.6%**	**20** **11.6%**	**173**

Table 6 compares the members and non-CIAL members in relation to their participation in community organizations. In general the people from the communities participate in at least one organization (86.1%). Of the nonmembers, 51.8% do not participate in more than three organizations; whereas 63.9% of the CIAL members participate in at least four organizations, which could imply a greater level of commitment with the community.

Discussion

In the analysis of frequencies there was a greater difference between the members and non-CIAL members with respect to the level of schooling, which was confirmed by the multiple correspondence analysis, where this variable is taken as supplementary or explanatory. According to the multiple correspondence analysis, there were statistical differences between the members and non-CIAL members, where the former are characterized primarily by land tenure of areas greater than 3 ha; generation of employment during periods greater than 6 months; nonscarcity of food; and high levels of community participation (more than 6 organizations). All these factors were explained by the level of secondary education.

Benefits of being a CIAL member

The idea was to learn the benefits that the CIAL farmers obtain with respect to human and social capital by answering the research questions: What are the benefits of being a CIAL member? What are the impacts resulting from participating in the Committee?

Human capital

The theory of human capital, developed by Gary Becker in 1964, is defined as the set of productive skills that an individual acquires by accumulating general or specific knowledge[122]. Some indicators of this capital could be taken in function of leadership and the capacity for acquiring new knowledge that facilitates problem solving in a community.

Table 7. Relation between the trials conducted outside the CIAL and new crops tested within the CIAL.

Experiments Outside the CIAL	New Crops Tested			Total
	Never	A Few	Many	
No	12 52.2%	10 43.5%	1 4.3%	**23**
Yes	1 7.7%	4 30.8%	8 61.5%	**13**
Total	**13** **36.1%**	**14** **38.9%**	**9** **25.0%**	**36**

[122]http://multitudes.samizdat.net/article.php3?id_article=312

Table 7 shows the relation between the trials done outside of those that they normally implement in the CIAL, in which the farmers test new crops or technologies. There were 23 members who did not conduct trials outside of those done by the CIAL. Of the group of those that did conduct other experiments besides those of the CIAL, 92.3% tried a new crop; within this percentage 61.5% had done so many times. The foregoing contrasts with those who have never conducted trials, where 52.2% have never experimented with new crops.

Table 8. Relation between new skills learned and the testing of new crops among the CIAL members

New Skills	Trial of New Crop Varieties			Total
	Never	A Few	Many	
None	1 50.0%	1 50.0%	0 0.0%	**2**
A few	6 54.5%	5 45.5%	0 0.0%	**11**
Many	6 26.1%	8 34.8%	9 39.1%	**23**
Total	**13** **36.1%**	**14** **38.9%**	**9** **25.0%**	**36**

According to Table 8, 94.4% of the members of the Committee have acquired new skills; and of these, those who learned only a few skills, 54.5% have not experimented with new crops. The foregoing contrasts significantly with those members that have acquired many skills, where 73.9% have tested new crops. The CIAL members that have learned new skills state that they have been trained in:

- ✓ New technologies for crop management
- ✓ Doing research in agriculture
- ✓ Organizing and administering agriculture and livestock production
- ✓ Marketing
- ✓ Speaking in public
- ✓ Organizing meetings with the community

From the foregoing, it can be stated that a greater increase in knowledge stimulates greater motivation to experiment, which enables the farmers to develop the capacity to solve problems, generate alternatives and implement technologies, which will, in the future, benefit both the community and themselves.

Social capital

For the World Bank,[123] social capital refers to the institutions, relationships and norms that form the quality and level of social interactions in a community. It not only represents the set of institutions within the community, but also the substance that keeps them together, such as shared needs, thoughts and the capacity to convene. In accordance with the same organism, "numerous studies show that social cohesion is a critical factor if societies are to prosper economically and for development to be sustainable… Both the institutions and the substance that joins them, seek to build the community so that society can conquer their feelings of dependence and acquire trust in themselves, so that they can design and execute projects based on the assets of the community itself."

Table 9. Relation between changes in the level of commitment of the CIAL members with the community and the organizations in which they participate.

Change in Level of Commitment	No. of Organizations in Which They Participate				Total
	Does Not Participate	1 - 3	4 – 6	> 6	
No	1 4.5%	10 45.5%	7 31.8%	4 18.2%	**22**
Yes	0 0.0%	2 14.3%	6 42.9%	6 42.9%	**14**
Total	**1** **2.8**	**12** **33.3%**	**13** **36.1%**	**10** **27.8%**	**36**

Table 9 compares the change in the level of commitment with the community and the number of organizations in which the committee members participate. It can be seen that 61.1% of the members have not changed their level of responsibility with the community, although their level of community participation, defined on the basis of the number of organizations in which they participate, is high (95.5%). On the other hand, 85.8% of the group that state that their level of commitment has changed participate in at least four organizations, which contrasts significantly with 50% participation in more than four organizations of those who state that they have not undergone changes in their level of community responsibility. It is possible that the members who have increased or improved their commitment to the community have acquired responsibilities with more organizations.

As the communities studied have an agricultural vocation, it is normal that there are problems related to production, to which the farmers seek solutions, which can be found within or outside their community.

[123] http://www.changecultural.com.ar/investigacion/construccion.htm

Figure 2 shows the percentages regarding the trust the communities have in some people from their own community for solving agricultural problems. It can be seen that 58.4% do not trust in anyone for solving their problems (blue bar), whereas 41.6% trust in at least one person (green bars). Despite the high percentage that do not trust in at least one person from the community to solve their agricultural problems, the social capital formed can be recognized with respect to some people's capacity for solving the community's problems. Of those people considered by the community to be trustworthy for solving agricultural problems, 50% are CIAL members (red bar). The foregoing, added to the better level of schooling of the CIAL members, the new skills learned and curiosity for experimenting with new crops, increases the social capital of the communities.

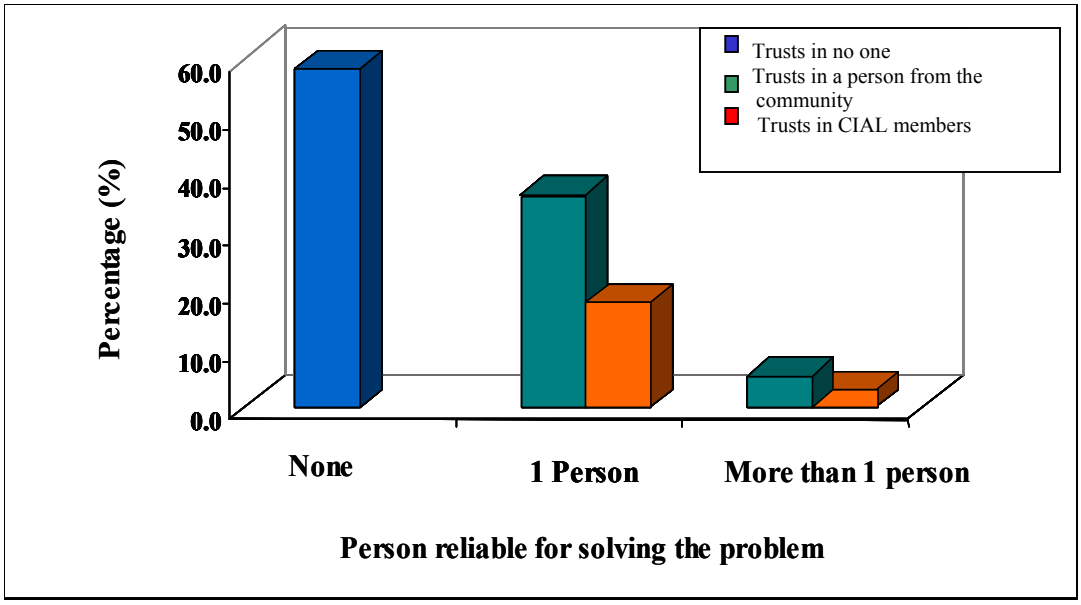

Figure 2. Relationship between the members of the community trusted to solve an agricultural problem and the CIAL members recognized for coming up with a solution.

Discussion

In the analysis of frequencies, we can see the existence of a group characterized by members that have conducted trials beyond those done by the CIAL, have experimented with new crops, learning other skills, changing their level of commitment with the communities, thereby leading to a higher level of community participation. The foregoing is corroborated by the multiple correspondence analysis, which distinguishes two groups. The first is characterized by their low community participation, which could be associated with their not changing their level of commitment to the community, their low interest in acquiring new skills or in testing new crops. In the second group are people with a high sense of belonging to the community, which is manifested by their high participation in organizations and their change in commitment with the community. They have also acquired new skills, which could be related to their interest in testing crops other than those that they generally plant. Using schooling as the explanatory variable, we can say that the higher level of studies is associated with the second group.

Therefore we can assume that the benefits of being a CIAL member are, to a great extent, reflected in the members with a higher level of education.

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Impact assessment of Local Agricultural Research Committees (CIALs) in Yoro Department, Honduras

Researchers: Lauren Classen, Sally Humphries, John FitzSimons, Susan Kaaria, José Jimenez, Omar Gallardo, Fredy Sierra

Introduction

This study examines the direct and indirect impact of the CIAL (local agricultural research committee) project in the Yorito region of North-Central Honduras. It is based on both qualitative and quantitative impact assessment research, funded jointly by CIAT (International Center for Tropical Agriculture Research) and the University of Guelph. The fieldwork was completed in April 2004.

The purpose of this research was to use different impact assessment (IA) methods to measure CIAL project outcomes and benefits in specific terms—economic, social, human, physical and environmental in nature—that impact on poor households, particularly in the area of food security. These outcomes are examined from a livelihoods perspective with the understanding that poor, subsistence farmers have diverse livelihood systems and that there are environmental, political and sociocultural, barriers to the adoption of new technologies.

The CIAL project in Honduras aims to improve social, human and economic capital assets among farmers who typically have little or no access to national research systems, by assisting them in the development and testing of different technologies that meet their priorities and that are adapted to their micro-landscapes. This is done by bringing together interested farmers in geographically defined communities into a CIAL. A CIAL can be defined as a "farmer-run research service that is answerable to the local community, with the objective of experimenting with locally unknown and unproven farming methods, to identify appropriate locally solutions" (Ashby et al., 2000). A basic premise of the CIAL approach is to serve as a platform for communicating the needs of poor farmers to the formal R&D systems and to create a 'demand-pull' on the supply of agricultural innovations (Ashby et al., 2000).

Methodology

Issues of reliability and objectivity

The focus of these results is on the more quantitative findings; the qualitative results from an earlier Master's thesis at the University of Guelph were used to develop the survey and are used to inform discussion in this report. The analysis was done at the individual (respondent level), household and community levels (Table 1). In all cases tests were run to see if there were differences related to community elevation, accessibility to market, as well as gender differences in CIAL membership household characteristics. In the cases where gender differences in household membership influenced impact, these data are displayed in tables and discussed.

Table 1: Sampling Frame for the Study

	CIALs Level	Community Level	
		With CIALs	Without CIALs (Counterfactual)
Individual Household Surveys	Four CIAL members from each of 10 CIALs	Household level interviews conducted in tree communities	Household level interviews conducted in two communities

It is important to mention here that the counterfactual communities selected were problematic for this research as CIALs are often formed in the Yorito region in response to an invitation by the community. Therefore the very fact that these two counterfactual communities had not asked for a CIAL makes them different from those communities that have CIALs. This being the case and without baseline data for comparison, it is very difficult to conduct the comparisons between communities with and without CIALs.

Study objectives

- ✓ Assess the effectiveness of the CIAL methodology
- ✓ Assess the costs and benefits of the CIAL to its members as well as the members of the community
- ✓ Use the results of this impact study actively for institutional learning and change

Research questions

- How effective is the CIAL methodology and how relevant is it to local problems and needs?
- What are the benefits of being a CIAL member, and what are the long-term impacts that result from having participated in the CIAL?
- How has the CIAL benefited its community?
- What are the costs associated with CIALs? Are CIAL activities as cost effective as possible to achieve desired impact?
- What has allowed for these impacts to occur in the Honduras context? Are these impacts sustainable? Why or why not?
- What is the role of the second-order associations in increasing robustness and sustainability of the CIAL process?
- How have the second-order associations supported the development of CIAL activities?

Criteria for selecting CIAL community

- CIAL communities in Yorito and Sulaco
- Stratification of CIALs done by age and gender of membership
- CIALs in existence for four years or less excluded
- CIALs with different membership composition: Mixed, women only, different levels of well-being, experience with participatory plant breeding

Formal survey questionnaires

Ten CIALs were selected from Yorito and Sulaco. To understand the impact of the CIALs on individual as well as other community members, individual farmer surveys were conducted in ten CIAL communities. In order to control for changes attributable to CIALs in communities and the members, two counterfactual communities were be surveyed. In each of the 10 CIAL communities, both CIAL and non-CIAL members were interviewed. The sample was stratified normally. In each household both the male and female heads of household were interviewed. Table 2 gives the names and characteristics of the CIALs included in the study.

Table 2: CIALs included in the study

Name of Community	Date Created	Number of members		Number of Households in Community	Sample Size for Survey
		Men	Women		
Río Arriba	1996	6	5		
Luquigue	1996	10			
San Antonio	1996		10		
Guaco	1997	6	2		
El Plantel	1998	7	2		
Los Cafetales	1998	11	4	28	14
Mina Honda	1998	9	8		
Santa Cruz	1998	5	2	46	23
La Patastera	1999	4	3		
Pueblo Viejo	1999		12	42	21

Results and discussions

Geographic and socioeconomic context

Honduras is 112, 090 sq. km of rugged mountainous territory, upon which over half of the estimated 6.5 million residents (World Bank, 2000) eke out a living. With a per capita GNP of US$730 (1998), Honduras ranks among the lowest-income countries in the Western Hemisphere, characterized by rural poverty with the majority of rural households living in conditions of extreme indigence (World Bank, 1999, 2001). In 1999, 75% of the rural population of Honduras lived below the poverty line (World Bank, 2001). The rural poor represent 59% of all Honduran households under the poverty line, and rural indigence afflicts 65% of all households in this category (World Bank, 2001). There is severe food insecurity, with 35% of the population unable to supply themselves with maize, the basic staple; and 65%, with beans (Barreto et al., 1998). The damage from Hurricane Mitch in 1998 was concentrated in rural areas and continues to exasperate these conditions today as Honduras slowly works to restore homes, bridges and roadways.

Agriculture for export and internal consumption is the largest employer of labor in the Honduran economy. Given the limited fertile valleys suited to farming and the severe inequality in land distribution, many farmers are forced to work on resource-poor, steeply sloped land unsuited for agriculture. According to the World Bank (2001), 72% of the producers in Honduras own 11.6% of the cultivated area; whereas 1.7% of the large landowners (those with 100-ha units or larger) own 30% of the cultivated land area. Furthermore, it found that 35.8% of the rural families did not own any land of their own.[124]

While agriculture employs an estimated 60% of the population, it produces only one-quarter of the nation's GDP (Humphrey, 1997). The National Program of Sustainable Development (PRONADERS) (of the Honduran Government) found that a very small percentage of the producers control the majority of the arable land in Honduras. Over half of the country's arable land is owned by the Honduran Government and the two largest banana companies (Chiquita and Castle & Cooke, formerly Standard Fruit) (Humphrey, 1997).

The development of civil society has been impeded by extreme social inequality and repressive military regimes, which have acted to maintain the status quo for almost two decades of violent conflict throughout Latin America. Anti-Communist fervor promoted by successive Honduran governments actively discouraged, and indeed penalized, collective activities at the community level, leading to a climate of fear and distrust. Evangelical religions, which have expanded rapidly throughout the region in recent decades, have reinforced this fear of group activities through the belief that the anti-Christ will appear amidst collective undertakings (Humphries, 1996; Probst, 2002). Such conditions have had a negative effect upon the development of social capital in Honduras. Community institutions are generally weak, and leadership is poor in many areas of the country.

These conditions make institutional development a prerequisite for the promotion of civil society. Honduras clearly needs access to new information, education and technology that fills the void created and sustained by the Government. Development must include support for collective activities in order to strengthen communities and rebuild local confidence in their own capacities for innovation, as well as individual-level and institutional linkages associated with strong social capital (Classen et al., 2003).

History of the CIALs in the country

The CIAL methodology came to Honduras with Dr. Sally Humphries in 1992 while she was working with the CIAT Participatory Research in Agriculture Project (IPRA). Together with a local agronomist, José Jiménez, who was at the time employed by the SRN, she began helping interested farmers in northern Honduras form CIALs and look for solutions to problems with soil fertility related to rapid deforestation, associated with shifting agricultural practices. They worked with six CIALs in the area.

Here they learned two very significant things about the CIAL methodology that brought them to Yorito and helped shape the CIAL methodology used throughout rural Honduras today:

[124] Barreto et al. (1998) found similar figures for a land distribution in a national study.

- As the CIAL methodology requires significant inputs of time and energy on the part of the farmers, the process appeals to farmers that have a high level of necessity and few options in terms of access to information and new technologies appropriate to their needs. Thus the CIAL process, which focuses on capacitating and empowering the farmers, must be accompanied by relatively short-term socioeconomic benefits in order to keep poor farmers interested and hopeful during the process of developing appropriate local solutions to their needs (Humphries et al., 2000).
- Owing to the traditional top-down development in Latin America, which decreased peoples' confidence in their own abilities to develop solutions to their problems, they felt dependant on hand-outs of new technologies, which are often inappropriate or applicable only in the short term. This context significantly slows the process of human capital development and empowerment and augments the need for rapid, visible project benefits in order to maintain interest and help recover low self-esteem among poor Honduran farmers (Classen et al., 2003).

In February 1996, following a workshop on the CIAL methodology, agronomists José Jiménez, Nelson Gamero and Juan Gonzáles began working with CIALs in the Departments of Yoro, Yeguare and Santa Barbara, respectively. There are fewer accessible natural resources in these regions, which are characterized by very steep slopes and poor soil quality. In Yoro, supported by a local NGO, Foundation of Participatory Research with Farmers from Honduras (FIPAH), the CIALs Luquigue, Rio Arriba and Vallacillos began working on selecting quality beans for planting, better hillside planting techniques, and soil conservation techniques in response to community-recognized needs in these areas. Today Luquigue and Rio Arriba are the oldest CIALs in Yoro and are 2 of the 85 CIALs active in Honduras today.

The CIAL members

In total FIPAH supports 60 CIALs, 25 of which are in Yoro. On average, each CIAL has nine members, with the membership ranging from 6-23. Of the 25 in Yoro, 3 have only women, 2 are male-only, and 20 are mixed, with more CIALs converting to mixed membership each year. Initially CIAL membership represented the leaders in the communities, who were outgoing men with a medium- to medium-poor socioeconomic status relative to their communities. It is extremely important to recognize that everyone in these communities is living below the national poverty line so this categorization is ***relative to the economic status of fellow community members***. However, realizing this as a limitation, FIPAH has taken measures to encourage more inclusive membership, which in return has affected the shapes and activities of the CIALs.

This is section presents results from the first preliminary analysis and focuses on the following research questions:

- ✓ Are CIAL members representative of their communities?
- ✓ What are the human and social capital impacts of being a CIAL member, and how do these benefit the communities?
- ✓ How do communities benefit (economic, physical and natural impacts) from having a CIAL?

- Are CIAL members representative of their communities? Who are they? This is an important aspect because it is important for CIAL members' households to be representative of the communities from which they come from because this implies that even the poor and disadvantaged can also participate and benefit from the CIAL process.

  This study found that CIALs in the Yorito region are representative of their communities in most measures of socioeconomic status. The results show that there no significant differences in total land size or cultivated land size between member households and nonmembers' households in CIAL communities (Tables 3-4). The overall average size of total land owned is 3.1 manzanas (mz) or 2.17 ha, and the cultivated land size is 2 mz or 1.4 ha (Tables 5-6). In both groups the average amount of land cultivated in partnership with others (Table 7) was from 1-1.7 mz, and the average amount of land rented to others was 0.05 mz for nonmembers' households and 0.7 mz for members' households, with no significant differences (Table 8). There were no significant differences between members' and nonmembers' households in primary crops, which in both cases were maize and beans; nor were there differences in the average percentage of land dedicated to coffee: 23.6% (Table 9). Finally, the same percentage of families in both groups hires farm laborers each year, and the average no. of weeks of off-farm work per family last year was not significantly different (overall avg. of 21 wk). In all measures of land size and farming system, CIAL members are representative of their communities.

Table 3. Mean area of cultivated land: comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

	CIAL member & non-CIAL member families	**N**	**Mean**	**SD**
Total area cultivated	At least one CIAL member in family	44	1.8580	1.45813
	No CIAL members in family	32	2.0703	1.22842

Not significantly different @ 95% level, T-test .
Note: Non-CIAL communities and former members excluded from analysis; SPSS Output = Sept. 17 A.

Table 4. Mean area of total land owned: Comparing households with at least one CIAL member and households with no members in CIAL communities.

	CIAL member & non-CIAL member families	**N**	**Mean**	**SD**
Total land size	At least one CIAL member in family	47	3.3032	4.47060
	No CIAL members in family	33	3.1174	2.93549

Not significantly different @ 95% level.
Note: Non-CIAL communities and former members excluded from analysis; SPSS Output = Sept 17 A.

Table 5. Total land size broken down, comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

			No Land	0.1-0.5 mz	0.5-1.1 mz	1.1-2 mz	2.1-5 mz	> 5 mz
CIAL & non-CIAL member families	At least one CIAL member in family	Count	1	5	6	13	18	4
		%	2.1%	10.6%	12.8%	27.7%	38.3%	8.5%
	No CIAL members in family	Count	1	2	4	13	6	7
		%	3.0%	6.1%	12.1%	39.4%	18.2%	21.2%

N = 80; not significantly different @ 95% level, Chi square and Mann Whitney U (prob. small #'s).

Table 6. Cultivated land size broken down, comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

			No land	0.1-1 mz	1.1-2 mz	2.1-3 mz	> 3.1 mz
CIAL member & non-CIAL member families	At least one CIAL member in family	Count	2	15	18	4	5
		%	4.5%	34.1%	40.9%	9.1%	11.4%
	No CIAL members in family	Count	1	7	12	8	4
		%	3.1%	21.9%	37.5%	25.0%	12.5%

N = 76, not significantly different @ 95% level, Chi square and Mann Whitney U (small no.).

Table 7. Mean area of land cultivated in partnership with family: Comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

	CIAL member & non-CIAL member families	N	Mean	SD
Total land cultivated in partnership with others	At least one CIAL member in family	18	1.6667	3.51468
	No CIAL members in family	18	.9722	1.78616

Not significantly different @ 95% level, T-test.

Note: Non-CIAL communities and former members excluded from analysis; SPSS Output = Sept 17 A.

Table 8. Mean area of land rented to others: Comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

	CIAL member and non-CIAL member families	N	Mean	SD
Total land rented	At least one CIAL member in family	15	.7333	1.37408
	No CIAL members in family	21	.0476	.21822

Not significantly different @ 95% level, T-test (equal var. not assumed).
Note: Non-CIAL communities and former members excluded from analysis; SPSS Output = Sept 17 A.

Table 9. Mean percentage of land area dedicated to coffee: Comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

	CIAL member & non-CIAL member families	N	Mean	S. D.
% Total cultivated land in coffee	At least one CIAL member in family	48	25.0682	39.92274
	No CIAL members in family	38	22.1840	32.07042

Not significantly different @ 95% level, T-test.
Note: Non-CIAL communities and former members excluded from analysis; SPSS Output = Sept 17 A.

Likewise, there were no significant differences between member and nonmember households with respect to housing materials or household structure (Table 10). Housing materials are a local indicator of socioeconomic status and were used in this survey by allocating a number value to each material, together with the local participants. The higher the number, the better the material, relative to the best and worst housing materials in these communities. The average overall rating for nonmember families was 6.13/14 and for member families were 6.62/14, both with a low SD, indicating little variation from the mean. Similarly, household composition in terms of average no. of dependents (6.3), no. of productive adults (3.4) and productive men (1.4), no. of children under 10 (1.5), no. of women between ages 11 and 18 (0.5) were not significantly different.

Table 10. Housing materials: Comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

	CIAL member & non-CIAL member families	N	Mean	SD
Housing materials (calculated from ceiling, floor, walls); higher no. = better materials	At least one CIAL member in family	50	6.62	1.783
	No CIAL members in family	30	6.13	2.047

N = 80, not significantly different, T-test.

There were significant differences in animal ownership among CIAL member and nonmembers' families and rented land size. The largest difference in the average no. of animals owned was in the poultry category, with 14.3 for CIAL families and 8.8 for non-CIAL families. However, in participatory activities, many women explained how their cooperation with the CIAL has enhanced their capacity for social mobilization. The women involved with the CIAL have solicited aid from the municipality and from other organizations for things such as community infrastructure and poultry care. It is likely therefore that many of these CIAL families will be better equipped to care for their poultry, making them more resistant to diseases that often kill off entire flocks.

There is also a small, but significant difference between the no. of pack animals and pigs owned by member and nonmember families. CIAL families own an average of 1.5 pack animals whereas nonmembers' families own an average of 1.1. This difference, however small, may indicate an increased acquisition of pack animals by CIAL members, who now require transportation to bring produce to local markets or to attend CIAL meetings in central areas. CIAL member households also own 0.7 more pigs on average than nonmembers households. This seems to signal a slightly higher level of economic well-being as pigs are a common method of keeping 'savings.' Table 11 indicates that 55.1% of CIAL-member households have savings compared to 10.8% for nonmember households. These savings may be reflected in the no. of pigs owned by the household. Furthermore, in the case of small animals such as rabbits, only non-CIAL families owned them (avg. 1.05). No significant differences were found in animals that indicate more traditional economic stability such as cattle (avg. number owned, 0.6) and ruminants (avg. number owned, 0.2). This further reiterates the theory that the small differences in poultry, pig and pack animals for CIAL members are likely a result of recent acquisitions of these animals rather than an indicator of an initial higher level of socioeconomic well-being.

Table 11.Whether or not farmers have savings: comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

			Save money	
			No	**Yes**
CIAL member & non-CIAL member families	At least one CIAL member in family	Count	22	27
		% within CIAL & non-CIAL member families	44.9%	55.1%
	No CIAL members in family	Count	33	4
		% within CIAL & non-CIAL member families	89.2%	10.8%

N = 86, significantly different @ 95% level, Chi Square, p = 0.000.
Note: Non-CIAL communities excluded. Survey question only asked of head of family (usually male).

Although CIAL member families seem to be representative of the households in their communities in terms of socioeconomic status, the CIAL appeals to *individuals in these households* with higher levels of education. In the case of CIAL members, 47% have 4-6 years of elementary education; whereas in the case of nonmembers, 71.6% have 3 or fewer years of elementary education (Table 12).

Table 12. Level of education (ordinal) –excluding non-CIAL communities.

			Education level of respondent reduced			
			No education	**1-3 yr elementary**	**4-6 yr elementary**	**Some secondary schooling or more**
Membership or nonmembers CIAL	Not a CIAL member	Count	32	36	24	3
		% within membership or CIAL nonmembers	33.7%	37.9%	25.3%	3.2%
	CIAL member	Count	10	21	29	2
		% within membership or CIAL nonmembers	16.1%	33.9%	46.8%	3.2%

N = 157, statistically significant at the 95% level, Mann Whitney U.; p = 0.003.
Note: Non-CIAL communities and former members excluded from analysis; SPSS Output = Sept 17 A

Similarly, 80% of the CIAL members are literate compared to 64.3 % of nonmembers. Although this reflects the difference in education levels, many CIAL members have begun to take literacy courses over the radio since their involvement with the CIAL. National radio education programs also came out at the same time as the CIAL in many communities, and the CIAL played a role in encouraging participation in community activities such as education programs. The CIALs do not exclude illiterate people (20% of CIAL members are illiterate) and the differences in literacy among members and nonmembers may reflect encouragement on part of the CIAL for its members to take literacy courses.

In summary, there are no significant differences between CIAL members' and nonmembers' households in terms of total and cultivated land area, main crops grown, amount of land dedicated to coffee, or the weeks of off-farm work. Households have the same level of locally defined socioeconomic status (determined by housing materials), and there are no significant differences in household composition. The only significant differences at the household level are in the average no. of chickens and pigs, ruminants and pack animals, the last three being a difference of less than two animals on average.

At the individual level, however, it seems that direct participation in the CIAL appeals to those with more than an elementary education, and CIALs are composed primarily of literate individuals. As many of the participants have said, the CIAL is "a little school for learning," and as such it makes sense that it would appeal to the same people who had chosen/had the option of staying longer in school. However, CIAL activities have resulted not only in improved agricultural techniques, adoption of new varieties and improvements in food security, but also in a number of social and human capital outcomes and benefits to member households that were not anticipated in the Project objectives. CIAL members have learned a variety of skills through their participation in the CIAL, including social and communication skills, food preparation, marketing and financial budgeting skills, as well as sewing (Table 13). The most widely chosen motivating factor for CIAL members to join the CIAL for both men and women was learning different agricultural techniques and how to investigate new varieties and select plants and seeds for 83 % of the male participants and 79% of the female participants. This was followed by other factors such as learning to prepare new foods, better production results with the CIAL and improved social skills. This being the case, it is also possible that literacy and education levels have been acquired since becoming involved with the CIAL in response to participant recognition of the value of such endeavors, combined with ready access to national radio education programs.

Table 13. Skills taught by the CIAL that are not directly related to agriculture.

		Learned something besides agriculture from the CIAL			
		Prepare different recipes	**Sewing**	**Social skills**	**Savings & marketing skills**
Gender	**Male**	50.0%		30.0%	20.0%
	Female	79.3%	10.3%	3.4%	6.9%

N = 39

- What are the human and social capital impacts of being a CIAL member and how do these benefit the communities? CIAL members have changed their farming and experimentation methods profoundly over the past five or so years, and today they are recognized as

agricultural leaders in their communities. Almost half (46%) of them have changed their method of determining whether or not a new variety is appropriate in their own fields compared to a 7.1% change among nonmembers. Of those who have changed, 76% attributed these changes to the CIAL in their communities. The majority of the CIAL members explained that before they planted many varieties together and did not know how to test one against another.

Overall, the CIAL is well known in most communities (86%), and most nonmembers have learned from the CIAL in their community. Of those respondents, 63.5 % said that they had learned new farming techniques from the CIAL, and 53% said that at least one person in their household had visited a CIAL experiment. Many (41%) feel that the CIAL in general does "useful" research, and 36.6% have participated directly in CIAL activities. In fact, when asked what they would like the CIAL to investigate in their communities, the top three responses were: "continue investigating new bean and maize varieties" (33.8%), "test vegetable gardening techniques/varieties" (16.9%), and "produce more maize and beans to sell to the community" (11.3 %)—three things that all the CIALs are already accomplishing. These responses indicate an overall confirmation of the appropriateness of CIAL research for the local community and a local interest in the outcomes of CIAL activities.

As a result of their capacity for experimentation and enhanced agricultural skills, individual CIAL members are recognized as agricultural leaders in their communities. In CIAL communities, 76.2 % of the CIAL members and 60.2% of the nonmembers recognized someone as the "agricultural experimenter" in their communities, who was identified (either during the interview or later on) as a CIAL member. Similarly, 81% of all those recognized as the "most knowledgeable about agriculture" by CIAL members and 61.7 % of those recognized by nonmembers were also CIAL members. When farmers were asked where they seek agricultural advice in their communities, 78.1 % of the CIAL members said that they can rely on the CIAL to find solutions to these problems, and 31.0% of the nonmembers said the same. Another 33% of the nonmembers said that they go to a local organization, without being more specific—some of which would be the CIAL or CIAL members, but they call the CIAL by another name.

- How do communities benefit (economic, physical and natural impacts) from having a CIAL? There is notable diversity among CIAL members and nonmembers in the nature and extent of CIAL project impact. Generally, despite the positive reaction of nonmembers towards the CIAL in their communities, economic impact is limited to direct participants in the CIAL and insignificant among nonparticipants (again, this is difficult to say with certainty due to the lack of baseline information and unreliable counterfactual communities). CIAL members have experienced significant differences in increased maize and bean yields, a decrease in the severity of the "hungry period" and an increase in savings compared to non-CIAL members. However, for both groups, there is a general sense of self-confidence and hope that has grown over the past 5 years. This, combined with the overall knowledge and positive reaction to the CIAL by nonmembers, may indicate a propensity for more extended adoption and impact among non-CIAL members as they become more familiar with CIAL varieties.

CIAL members have experienced significant improvements in both maize and bean yields. Of the CIAL households, 61% have experienced better maize yields in the past 5 years compared to 29% of nonmember households (Table 14).

Table 14. Changes in maize yields: Comparing households with at least one CIAL member and households with no CIAL members in CIAL communities.

			Maize yields have changed		
			Better	**Same**	**Worse**
CIAL member & non-CIAL member families	At least one CIAL member in family	Count	30	8	11
		% within CIAL member & non-CIAL member families	61.2%	16.3%	22.4%
	No CIAL members in family	Count	10	10	14
		% within CIAL member & non-CIAL member families	29.4%	29.4%	41.2%

N = 83, significantly different @ 95% level, Chi square p = 0.017, Mann Whitney U, p = 0.008.

Similarly with beans, 56% of the member households have experienced an increase in bean yields in the past five years compared to 32% of nonmember households (Table 15).

Table 15. Changes in bean yields: comparing households with at least one CIAL member and households with no CIAL members in CIAL communities

			Bean yields have changed		
			Better	**Same**	**Worse**
CIAL member & non-CIAL member families	At least one CIAL member in family	Count	27	12	9
		% within CIAL member & non-CIAL member families	56.3%	25.0%	18.8%
	No CIAL members in family	Count	11	10	13
		% within CIAL member & non-CIAL member families	32.4%	29.4%	38.2%

N = 83, significantly different @ 95% level, Mann Whitney U, p = 0.021.

If we separate household membership by gender (Table 16), it is men's participation in maize production that contributes most importantly to increased yields, with 71% of the male CIAL members reporting an increase in maize yields, compared to 77% when both husband and wife participate in the CIAL. While 77% of husband and wife teams also report a bean yield increase (Table 17), only 58% of the men who participate on their own in the CIAL, report a yield improvement. This suggests that women's participation in bean innovation alongside their husbands is important in obtaining a yield increase, whereas in maize women's contribution to joint research is less evident. This is perhaps understandable in view of the traditional division of labor in which women play a role in the field in beans production (usually pulling them up at harvest time) but a negligible field role in maize.

Table 16. Changes in maize yields: comparing households with different CIAL membership characteristics in CIAL communities.

			Maize yield has changed		
			Better	**Same**	**Worse**
Gender-segregated membership with the CIAL	CIAL community, both members	Count	10	2	1
		% within gender-segregated membership with the CIAL	76.9%	15.4%	7.7%
	CIAL community, only husband is member	Count	15	2	4
		% within gender-segregated membership with the CIAL	71.4%	9.5%	19.0%
	CIAL community, only wife is member	Count	5	4	6
		% within gender-segregated membership with the CIAL	33.3%	26.7%	40.0%
	CIAL community, neither is member	Count	10	10	14
		% within gender-segregated membership with the CIAL	29.4%	29.4%	41.2%

N = 83, significantly different @ 95% level, Chi square, p = 0.017 (problem with small nos.); Kruskal-Wallis: significantly different @ 95% level, p = 0.004.

Table 17. Changes in bean yields: comparing households with different CIAL membership characteristics in CIAL communities.

			Bean yields have changed		
			Better	**Same**	**Worse**
Gender-segregated membership with the CIAL	CIAL community, both members	Count	10	1	2
		% within gender-segregated membership with the CIAL	76.9%	7.7%	15.4%
	CIAL community, only husband is member	Count	11	5	3
		% within gender-segregated membership with the CIAL	57.9%	26.3%	15.8%
	CIAL community, only wife is member	Count	6	6	4
		% within gender-segregated membership with the CIAL	37.5%	37.5%	25.0%
	CIAL community, neither is member	Count	11	10	13
		% within gender-segregated membership with the CIAL	32.4%	29.4%	38.2%

N = 82, not significantly different @ 95% level, Chi square (problem with small nos.).
Kruskal-Wallis: Significantly different @ 95% level, p = 0.014.

The main reasons for improvements in maize and bean yields also differ. In the case of maize, 51% of those with improved yields attribute it to the application of better farming techniques. In the case of beans however, better yields were attributed to new and better varieties in 43% of the cases (Tables 18-19).

Table 18. Reasons for improvements in maize yields.

		Frequency	% Valid
Valid	Applies better agricultural techniques (soil conservation)	19	51.4
	Applies more fertilizer	10	27.0
	New, better varieties	8	21.6

Note: Non-CIAL communities excluded. Respondents from all CIAL communities, who found that yields had improved were included.

Table 19. Reasons for improvements in bean yields.

		Frequency	%& Valid
Valid	Applies better agricultural techniques (soil conservation)	9	25.7
	Applies more fertilizer	11	31.4
	New, better varieties	15	42.9

Although the counterfactual communities were problematic because it was difficult to tell whether they are communities with the same needs as CIAL communities as they had not asked for a CIAL, the differences in their perceived "quality of life" is interesting (Table 20). In CIAL communities, 66.7% of the population felt that their lives have improved over the past 5 years vs only 32% of those in non-CIAL communities. In non-CIAL communities, 36% felt that their quality of life had become worse, compared to only 11.1% in CIAL communities.

Table 20. Changes in quality of life: Comparing CIAL communities and non-CIAL communities.

			Changes in quality of life over past 5 years		
			Improved	Stayed the same	Became worse
CIAL	Non-CIAL community	Count	8	8	9
		% within CIAL	32.0%	32.0%	36.0%
	CIAL community	Count	36	12	6
		% within CIAL	66.7%	22.2%	11.1%

N = 79, significantly different @ 95% level, Chi Square, p = 0.007.

Conclusions

We found significant impact for CIAL member households and limited impact at the community level. CIAL member households are representative of their communities in farm size and crops planted although there are small differences in animal ownership. CIAL member households tend to have more chickens and slightly more pigs and pack animals than nonmember

households, which may indicate improved livelihoods and reflect more savings among CIAL member households than nonmembers, which may be an indirect result of the CIAL. The CIAL appeals to people with slightly higher levels of education and although it is not limited by literacy, 80% of members are literate today. Again, this may reflect recognition of the importance of education and literacy by CIAL members and recent acquisitions of literacy skills through national radio education programs for adults. Overall, CIAL households have experienced increases in maize and bean yields over the past 5 years, while this is less true for non-CIAL households. Although it seems that the husband's participation with the CIAL is primarily responsible for the impact in maize yields, significantly more households with both husband and wife participating experienced increases in bean yields over the past five years than households with only one of either the spouses participating. Although it is difficult to measure impact at the community level, certainly nonmembers in CIAL communities are aware of the CIAL in their community and over 60% of the nonmembers, when asked what they would like the CIAL to investigate, were satisfied with the CIAL's current activities, indicating that they would like the CIAL to continue investigating things that the CIAL is already doing in their communities. Similarly, over 60% said that they had learned something from the CIAL in their community, and in general CIAL community members feel that their quality of life has improved since the time the CIAL was formed.

The results at the household level were found to be the most important as the impact was almost always most significant at this level; in other words, the benefits accrued by CIAL members often have direct benefits for their families. On the other hand, our results indicate that little benefit is "trickling" down to nonmembers in CIAL communities. For this reason, most of the analyses compare "nonmember households" or households with no CIAL members and "member households", or those with at least one CIAL member (where only one or both spouses are members).

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